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**COMMITMENT AND COLLABORATION:
THE ROAD TO FUSION ENERGY**

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Korea-U.S. S&T Relationship

Over the past half century, Korea and the United States have developed a strong relationship which began with political and military cooperation and later expanded into the field of science and technology. This strong Korea–United States relationship provided Korea with a firm foundation for its political and economic development and stability.

Korea is also indebted to the United States for its scientific and technological development. Many young Koreans came to the United States for advanced studies under various assistance programs and returned to Korea to become leaders in many areas of science and technology. In addition, the Korea Institute of Science and Technology, the first R&D institute in Korea, was established in 1966 with the financial and technical assistance of the United States.

As late as the mid-1960s, Korea was a barren land, severely lacking in science and technology. It has since experienced phenomenal economic and technological growth by learning and assimilating foreign technologies. Korea has emerged as one of the newly industrialized economies, and in some technology areas is at parity with the rest of the world. Given this development, it is inevitable that Korea and the United States redefine their bilateral relationship in science and technology. In the past, the flow of scientific knowledge and technology was unidirectional, from the United States to Korea, but the relationship is now being transformed into a more reciprocal one based on mutuality and equality. To help make the transition smoother, the Korean Government initiated a series of Korea–United States science and technology fora, which have been held every year since 1993.

We are currently conducting a series of three fora dealing with specific areas of science and technology. In June of 1996 a forum on ocean science and technology was held. In February 1997 we jointly explored what could be done to promote collaboration in fusion energy development. The

last of these three fora will be held in the fall of 1997 and will focus on specific issues in medical science.

Korea's Role in the International S&T Community

Korea's recent membership into the Organization of Economic Cooperation and Development (OECD) signifies that Korea is now a major player in the international economic community. This also means that Korea needs to share equally with other advanced countries the responsibility for world economic development. Korea can no longer remain a beneficiary, but must play the role of contributor in the international science and technology community.

In its transition toward an advanced economy, Korea is faced with various difficulties which stem from structural weaknesses in its economy. The overall slowdown of the Korean economy is having a negative impact on industrial investment and balance of payments, and it is eroding the international competitiveness of export products. The underlying cause of these problems is the high-cost of production which results from high wages, high interest rates, high land costs, and the low efficiency of the Korean economy as a whole. I believe that there is no better way to cure this structural weakness than by enhancing our capability in science and technology.

I am confident that Korea will be able to recover its economic dynamism as it did when it was in a similar situation at the end of the 1970s. Despite the current economic downturn, Korea will do its utmost to contribute to the advancement of science and technology by participating in international collaborative efforts.

Korea's Efforts in Fusion Research

Sustainable development of the world depends upon, among other things, energy, environment, and climatic change. Of these factors, what concerns Korea the most is the issue of energy. Korea relies almost completely upon foreign sources for its energy needs. Oil and gas consumed in Korea are all from foreign sources. Nuclear power accounts for more than 50 percent

of the total supply of electricity in Korea. It is critically important for Korea to secure long-term, stable supplies of energy. An equally important issue is that of the excessive consumption of fossil fuels and nuclear power production which are posing serious environmental problems in Korea.

One possible solution to these problems is fusion energy. If we can tame fusion, it will provide us with a virtually inexhaustible source of clean and safe energy. This is why Korea is so interested in fusion research. But that is not all, fusion research generates enormous scientific and technological spill-over effects, and through fusion research, Korea can contribute to the solution of the global energy problem.

In 1995, the Korean government drew up the "Basic Plan for National Fusion R&D," for which we will invest approximately 300 million dollars from 1996 until 2002. The plan aims at developing a next-generation facility for fusion research named KSTAR, which will upgrade Korea's capability in fusion research to an advanced level. It also aims to develop such leading-edge technologies as superconducting magnet technology, and large-scale, ultra-high, vacuum technology, to name a few.

However, we also know that there remain important scientific and technical problems that have yet to be resolved before we can benefit from fusion technology. For decades, fusion scientists have struggled to confine the ultra-hot plasma needed to produce fusion in a magnetic container. The plasma has both fascinated and frustrated researchers all over the world. We believe, however, that fusion research must continue, because it offers the prospect of a safer and more abundant source of energy. Indeed, the goal of producing fusion energy is the world's greatest scientific challenge.

Fusion research, huge in scale and complex in nature, involves enormous financial and technological risks. The risks are too great for a single nation to bear alone. Fusion research exemplifies the need for international collaboration.

In recognition of this enormous challenge and the need for collaboration, the European Community, Japan, the Soviet Union, and the United States launched an international cooperative

research effort in the mid-1980s on fusion. From the early discussions of these countries, the International Thermonuclear Experimental Reactor (ITER) project arose. The international fusion science community predicts that under current funding projections, the first demonstration fusion power plant will be operable in 2025 and commercial operation would start around 2035.

However, if the development of fusion technology is to proceed as projected, many argue that it will require far more financial and personnel inputs than what is currently invested in fusion research and development. This means that it may be necessary to recruit new partners from among technologically capable countries. Expanded membership to the international scientific joint venture of ITER will help spread the financial and technical burdens and increase the source of financial and personnel investments.

Given the cost and scientific complexity of fusion research and development, there is no question that Korea will not be able alone to accomplish the goals set forth the "Basic Plan for National Fusion R&D." In order to develop the core technologies necessary for KSTAR, it is essential for Korea to collaborate with the United States which stands at the forefront of fusion science and technology. In pursuit of the mutual benefits of such cooperation, the Ministry of Science and Technology of Korea and the United States Department of Energy concluded an "Implementing Arrangement for Fusion Research Cooperation" in June 1996. On the basis of the arrangement, the Korea Basic Science Institute and its counterparts in the United States, including the Princeton Plasma Physics Laboratory, have been working very closely.

Korea seeks to further expand international cooperation in fusion research with other advanced countries and international organization. Through active participation in international ventures for fusion research, such as the ITER project, Korea hopes to enhance domestic scientific and technological capability, contribute to the advancement of world science and technology, and help solve global energy problems. The Korean government is strongly committed to international cooperation in fusion research.

Conclusion

Fusion is a limitless source of energy which is free from environmental problems. But the scale of the effort required for the development of fusion energy dictates a need not only for continuous government funding, but also for international collaboration. I think that the ends will justify the means because few technologies promise more attractive returns on investment than fusion science and technology.